REMARKS

Claims 1-20 were pending. By this Amendment, claims 2, 3 and 11-20 have been canceled, without prejudice or disclaimer, and claim 1 has been amended to include the features previously recited in now-canceled claim 3, and claims 6 and 7 have been amended to depend from claim 1. Accordingly, claims 1 and 4-10 are now pending.

Claims 1 and 11 were rejected under 35 U.S.C. § 102(b) as purportedly anticipated by U.S. Patent No. 4,259,580 to Vogler. Claims 2, 3, 6, 12, 13 and 16 were rejected under 35 U.S.C. § 103(a) as purportedly unpatentable over Volger in view of U.S. Patent No. 6,366,865 to Chalupa et al. and further in view of Bonduel et al. (US2002/0008537A1). Claims 4, 5, 14 and 15 were rejected under 35 U.S.C. § 103(a) as purportedly unpatentable over Volger in view of U.S. patent No. 4,701,683 to Kikkawa. Claims 7-10 and 17-20 were rejected under 35 U.S.C. § 103(a) as purportedly unpatentable over Volger, Chalupa and Bonduel in view of U.S. Patent No. 6,341,155 to Kuzniar et al.

Applicant has carefully considered the Examiner's comments and the cited art, and respectfully submits that independent claims 1 and 11 are patentable over the cited art, for at least the following reasons.

This application relates to an X-ray tube device having an anode rotation mechanism which, by rotating the anode, increases an allowable load by moving an electron collision cross section. The rotation number of the anode is detected and controlled to shorten an X-ray radiation waiting time and prevent the anode from being damaged.

Applicant devised an improved approach wherein a voltage of the stator coil and a current flowing through the stator coil are detected, impedance of the anode rotation mechanism is calculated using the detected voltage and current, an impedance at the start of anode rotation is

stored, a ratio between the initial impedance and a present impedance is calculated, and the rotation number of the anode is detected on the basis of the calculated impedance ratio. Independent claim 1 addresses these features, as well as additional features.

Vogler, as understood by Applicant, proposes a control circuit for a rotary-anode X-ray tube wherein the anode rotation number is determined by multiplying together the currents through the two stator winding pairs and the sine of the phase angle between the two currents.

However, it is acknowledged in the Office Action that Vogler does not teach or suggest that a voltage of the stator coil and a current flowing through the stator coil are detected, impedance of the anode rotation mechanism is calculated using the detected voltage and current, an impedance at the start of anode rotation is stored, a ratio between the initial impedance and a present impedance is calculated, and the rotation number of the anode is detected on the basis of the calculated impedance ratio, as provided by the subject matter of claim 1 as amended.

Chalupa, as understood by Applicant, proposes an approach for estimating the coil resistance in an electric motor by utilizing a voltage across a stator coil and a current through a coil.

As acknowledged in the Office Action, Chalupa, like Vogler, does not teach or suggest an X-ray tube device wherein a voltage of the stator coil and a current flowing through the stator coil are detected, impedance of the anode rotation mechanism is calculated using the detected voltage and current, an impedance at the start of anode rotation is stored, a ratio between the initial impedance and a present impedance is calculated, and the rotation number of the anode is detected on the basis of the calculated impedance ratio, as provided by the subject matter of claim 1 as amended.

The remaining cited references fail to cure the deficiencies of Chalupa and Vogler.

Bonduel, as understood by Applicant, proposes an approach for monitoring the rotation of a DC electric motor, wherein angular position and angular speed are estimated utilizing measurements of the voltage and current supplying the motor obtained by sampling over time.

Kikkawa, as understood by Applicant, proposes an inverter circuit for converting DC power to pulse wave power, to drive a brushless motor.

Kuzniar, as understood by Applicant, proposes a system for detecting the rotational speed of an anode of an x-ray tube during use. In the system proposed by Kuzniar, a detector detects a pulse of secondary x-rays generated by the interaction of a stream of electrons. A single pulse is detected with each rotation of the anode and this information is utilized to correct the rotational speed of the anode.

Applicant does not find disclosure or suggestion in the cited art, however, of an X-ray tube device wherein a voltage of the stator coil and a current flowing through the stator coil are detected, impedance of the anode rotation mechanism is calculated using the detected voltage and current, an impedance at the start of anode rotation is stored, a ratio between the initial impedance and a present impedance is calculated, and the rotation number of the anode is detected on the basis of the calculated impedance ratio, as provided by the subject matter of claim 1 as amended.

An X-ray tube device or an X-ray radiation determiner having such features has the benefit that an estimation of the rotation number is not influenced by the initial impedance variation, that is the individual difference, aging, difference in type of the X-ray tubes. By using the impedance ratio calculated based on such information, estimation of the rotation number become accurate.

The cited art simply does not teach or suggest such an X-ray tube device or the benefits

that can be obtained from such a device.

Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claim 1 and the claims depending therefrom are patentable over the cited art.

In view of the amendments to the claims and remarks hereinabove, Applicant submits that the application is now in condition for allowance. Accordingly, Applicant earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that may be required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,

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